KINGS® by WINCHESTER ELECTRONICS

QUALIFICATION REPORT SUMMARY

KINGS® Fiber Optic Tri-Loc®
SMPTE Camera Connector

Index

1 Scope

The purpose of this document is to summarize the test results documented in the various internal Winchester Electronics test reports, which define intermateability, test samples, sequences, and methods used in the validation of the KINGS® SMPTE cable mount plug and jack connectors. Individual test reports are on file at Winchester Electronics.

2 Testing Summary

Test Procedure	Reference	Pass / Fail Criteria	Results
Thermal Shock	MIL-STD-202G	Continue to operate optically and electrically within the specified range of the SMPTE 304-2009 specified range	Pass
Moisture / Humidity Resistance	IEC 61300-2-19	Continue to operate optically and electrically within the specified range of the SMPTE 304-2009 specified range	Pass
Mechanical Retention (Mating/Un-mating Forces)	EIA-364, TP-13	Record Values	Pass
Cable Retention	IEC 61300-2-4	Cable to withstand a 100lb pull	Pass
Vibration	IEC 61300-2-1	Unit shall continue to provide optical and electrical performance per the SMPTE 304-2009 standard	Pass
Vibration	MIL-STD-202G	Unit shall continue to provide optical and electrical performance per the SMPTE 304-2009 standard	Pass
Shock	IEC 61300-2-9	Unit shall continue to provide optical and electrical performance per the SMPTE 304-2009 standard	Pass
Mating Durability	IEC 61300-2-2	Unit shall continue to provide optical and electrical performance per the SMPTE 304-2009 standard	Pass
Intermateability	KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector To Lemo Lemo to KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector	Connectors shall mate to any competitors SMPTE 304-2009 connector	Pass
Corrosion (Salt Spray)	MIL-STD-202	Units shall continue to provide optical and electrical performance during and after the testing cycle	Pass
Contact Retention		Record Values	Pass
Drop (Impact)	IEC 61300-2-12	Continued optical and electrical performance requirements to SMPTE304-2009 specification. No change in mating / de-mating capability	Pass
Cold -40C	IEC 61300-2-17	Continued optical and electrical performance requirements to SMPTE304-2009 specification	Pass
Hot Dry +85C	IEC 61300-2-18	Continued optical and electrical performance requirements to SMPTE304-2009 specification	Pass
Immersion	IEC 60529	No signs of internal water migration. Continued optical and electrical performance requirements	Pass

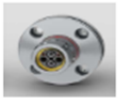
3 Test Equipment

Manufacturer	Description & Model Number	Serial Number
Instron	Force Tester 5500R	55R1123C5308
JDS Uniphase	Insertion/Return Loss Meter RX3070 Insertion/Return Loss Meter RX3070 Insertion/Return Loss Meter RX3070	DC056693 DC056690 DC056697
Cirris	Electrical Tester Analyzer T1	36167-T1
ESPEC	Environmental Chamber ESX-2CA	014977
Singleton	Salt Spray/Corrosion Chamber SCCH 20	n/a
Keithley	Ohmmeter 580	0633879
Ling Electronics	Vibrator / Shock Tester B385	75
Cincinnati	Humidity Chamber MCB-1.2-.33-.33-H/AC	MC024042
Tenney	Cold Thermal Chamber BTC	23532-11
Blue M	Hot Chamber CSZ23	007

4 Detailed Testing Information

A) TIA/EIA-455-107 Determination of Component Reflectance or Link/System Return Loss Using a Loss Test Set
B) TIA/EIA-455-171, Attenuation by Substitution Measurement – For Short-Length Multimode Graded-Index and Singlemode Optical Fiber Cable Assemblies
C) IEC 61300-2-4, Fiber Optic Interconnecting Devices and Passive Components – Basic Test and Measurement Procedures, Part 2-4, Fiber/Cable Retention
D) IEC 61300-2-17, Fiber Optic Interconnecting devices & passive components – Basic test and measurement procedures, Tests – Cold
E) MIL-STD-202, Method 101, Corrosion / Salt Spray
F) IEC 61300-2-12, Fiber Optic Interconnecting Devices and Passive Components – Basic Test and Measurement Procedures Method A, Tests – Impact
G) IEC 61300-2-18, Fiber Optic Interconnecting devices & passive components – Basic test and measurement procedures, Tests – Dry Heat
H) IEC 61300-2-19, Electromechanical components for electronic equipment; basic testing procedures and measurement methods, Part 2-19, Damp Heat (Steady State)
I) IEC 61300-2-2, Fiber Optic Interconnecting devices & passive components – Basic test and measurement procedures – Part 2.2: Tests – Mating Durability
J) IEC 60529 Edition 2.1, Section 4.2, Degrees of Protection Provided By Enclosures
K) EIA-364, TP-13. Mating and un-mating forces
L) IEC 61300-2-9, Fiber Optic Interconnecting Devices and Passive Components – Basic Test and Measurement Procedures, Part 2-9, Shock
M) MIL-STD-202G, Method 107, Thermal Shock
N) IEC 61300-2-1, Fiber Optic Interconnecting Devices and Passive Components – Basic Test and Measurement Procedures, Part 2-1, Vibration (Sinusodial)
O) MIL-STD-202G, Method 204D, Vibration

Mating Durability / Intermateability:

			KINGS® FIBER OPTIC TRI-LOC® SMPTE 304 PLUG CONNECTORS		
			 (7765-3-3) Winchester Cable Mount Plug Connector	 7765-400-F1102 Winchester Panel Mount Plug Connector	 7765-400-F1102 Winchester Panel Mount Plug Connector For Cable (W/BOOT)
KINGS BRAND	7763-3-3 - Winchester Cable Mount Jack		Tested Durability Section 7.1 & 7.2	Tested Intermateability Section 8.2	Same as 7765-400-F1101
	7763-400-F1101 - Winchester Panel Mount Jack		Tested Durability Section 8.2	N/A	N/A
	7763-400-F1102 - Winchester Panel Mount Jack For Cable		Same As 7763-400-F1101 Above	N/A	N/A
	7763-400-F1103 - Winchester Panel Mount Nut Jack		Tested Durability Section 8.2	N/A	N/A
LEMO	PUW.3K.93C.TLCC96 - Lemo Cable Mount 9.2mm Jack		Tested Intermateability/ Durability Section 8.1	Tested Intermateability Section 8.2	Same as 7765-400-F1101
	PUW.3K.93C.TLCC12 - Lemo Cable Mount 12mm Jack		Same as PUW.3K.93C.TLCC96 Above	Same as PUW.3K.93C.TLCC96 Above	Same as PUW.3K.93C.TLCC96 Above
	PBW.3K.93C.TLCC96Z - Lemo Square Flange 9.2mm Jack		Same as Lemo EDW.3K.93C.TLC Tested Below	N/A	N/A
	EDW.3K.93C.TLC - Lemo Panel Mount Breakout Style Jack, Not For Cable Mount		Tested Intermateability and Durability Section 8.1	N/A	N/A

			KINGS® FIBER OPTIC TRI-LOC® SMPTE 304 JACK CONNECTORS			
			7763-3-3 Winchester Cable Mount Jack Connector	7763-400-F1101 Winchester Panel Mount Jack	7763-400-F1102 Winchester Panel Mount Jack For Cable (W/BOOT)	7763-400-F1103 Winchester Panel Mount Nut Jack Interface
						
KINGS BRAND	7765-3-3 Winchester Cable Mount Plug Connector		Tested Durability Section 7.1 and 7.2	Tested Durability Section 8.2	Same as 7763-400-F1101	Tested Durability Section 8.2
	7765-400-F1101 Winchester Panel Mount Plug Connector		Tested Durability Section 8.2	N/A	N/A	N/A
	7765-400-F1102 Winchester Panel Mount Plug Connector For Cable (W/BOOT)		Same As 7765-400-F1101 Above	N/A	N/A	N/A
LEMO	FUW.3K.93C.TLMC96 - Lemo Cable Mount 9.2mm Plug		Tested Durability Section 8.1	Tested Durability Section 8.2	Same As 7763-400-F1101	Tested Durability
	FUW.3K.93C.TLMC12 - Lemo Cable Mount 12mm Plug		Same as Lemo FUW.3K.93C.TLMC96 Above	Same as Lemo FUW.3K.93C.TLMC96 Above	Same as Lemo FUW.3K.93C.TLMC96 Above	Same as Lemo FUW.3K.93C.TLMC96 Above
	FXW.3K.93C.TLM - Lemo Panel Mount Breakout Style Plug, Not For Cable Mount		Same as FMW.3K.93C.TLMC96Z	N/A	N/A	N/A

Group 1: Wallingford Test Lab – Durability - Unit was secured to the fixture attached to the load cell on the Instron. Mate was secured to the fixture on the base of the Instron. The fixture applied clamping force to the release ring allowing the connectors to mate and un-mate properly. Units were cycled at 200mm per minute and cleaned every 500 cycles. Refer to section 7.2.

Group 2: Franklin Test Lab – Durability - One KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector plug and one KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector jack were setup and manually mated and de-mated 500 times with insertion loss and return loss being recorded at the initial and then each 50th mating thereafter. Electrical testing pre and post. Refer to Section 7.1.

Group 3: Franklin Test Lab – Intermateability / Durability - One KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector cable mounted plug was manually mated to the Lemo panel mounted jack 500 times. The optical interfaces were cleaned only when an insertion loss or return loss issue arose. Optical readings were recorded throughout the testing cycle. Electrical testing was pre and post. Refer to section 8.1.

Group 4: Franklin Test Lab – Intermateability / Durability – One KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector cable mounted jack was manually mated to the Lemo cable mounted plug 500 times. The optical interfaces were cleaned only when an insertion loss or return loss issue arose. Optical readings were recorded throughout the testing cycle. Electrical testing was pre and post. Refer to section 8.1.

Group 5: Franklin Test Lab – Intermateability – Lemo cable mount connetors to KINGS® Fiber Optic Tri-Loc® SMPTE Panel mount tests were performed to 100 cycles. The optical interfaces were cleaned only when an insertion loss or return loss issue arose. Optical readings were recorded throughout the testing cycle. Electrical testing was pre and post. Refer to section 8.2.

Thermal Shock:

Five mated pairs were subjected to thermal shock in accordance with MIL-STD-202G, Method 107, Test Condition A with modified temperatures of -40°C (+0/-3°C) and 85°C (+3/-0°C). Two thermal conditioning chambers were used, one set to -40°C and the other set to 85°C. The units were placed into the 85°C chamber first. They were conditioned for a minimum of one hour. Units were then transferred to the -40°C chamber. Units were transferred between two (2) thermal conditioning chambers five times. Units were tested optically and electrically before and after exposure to temperature.

Moisture / Humidity Resistance:

Five mated pairs were placed in a test chamber and subjected to moisture and heat in accordance with IEC 61300-2-19. Chamber was programmed to achieve and maintain 93 (+2/-3) % Relative Humidity for 336 hours. Units were maintained at ambient room temperature and humidity for two hours before placing them into the test chamber. Units were tested optically and electrically before and after exposure to temperature.

Mechanical Retention (Mating/Un-mating Forces):

Five pairs of connectors were tested for mating and un-mating forces. Units were secured in the Instron universal tester. The Instron was programmed to fully mate and un-mate the units. The Instron traveled at a speed of 200 mm per minute (≈ 8 mates per minute). Units were cycled 5 times and the 5^{th} cycle was recorded.

Cable Retention:

The units were tested using the Instron materials tester and fixture. The fixture was secured to the Instron load cell and the mandrel to the vice. The Instron was programmed to pull at a rate of 50 pounds per minute with a 60 second hold. Units were tested for optical performance after the test.

Cable Retention (Destructive):

The units were tested using the Instron materials tester and fixture. The fixture was secured to the Instron load cell and the mandrel to the vice. The Instron was programmed to pull at a rate of 50 pounds per minute until cable / connector failure.

Vibration:

Ten pairs of connectors were separated in to two groups of five.

The first group was tested in accordance with IEC 61300-2-1, Category O. They were subjected to vibration in X,Y and Z axis with a frequency range from 5-55 Hz, 1 octave/min sweep rate, 1.5 mm amplitude with a 2 hour per axis duration.

The second group was tested in accordance with Mil-STD-202G, Method 204D. They were subjected to vibration in X,Y and Z axis with a frequency range from 10 -2000 Hz, 0.06 inch double amplitude (maximum total excursion) with 7 cycles per axis duration.

Shock:

The units were tested in accordance with IEC 61300-2-9. The units were subjected to Shock-Pulses that were half-sinusoidal, acceleration – 150 m/s², duration – 11 ms. With 3 shocks in each axis.

Corrosion (Salt Spray):

The units were tested in accordance with MIL-STD-202, Method 101. Units were suspended in the salt fog chamber by coiling the cable over the fiberglass suspension rods. The units shall be approximately 15 degrees from parallel. The connectors shall not contact each other in the chamber (cables are allowed to touch/overlap). The units were subjected to 96 hours of exposure to 5% sodium chloride (NaCl) solution at 35°C +/- 3°C. Salt solution consumption shall be 3 to 3.5 quarts per 24 hour period.

Contact Retention:

Unit was secured in a vice on the Instron. Pin was secured to the load cell and pressure was applied. Maximum force before damage was recorded.

Drop Testing (Impact):

Each of the cabled connectors was connected to the holding fixture. The fixed end of the unit was attached to a fixture set at a height of 2 meters above the concrete floor. The unit under test was then manually raised to the 2 meter level and allowed to free fall from a horizontal position in a pendulum motion. This test was performed five times on each unit.

Cold Testing (To -40C):

Five paired units were placed into the environmental chamber. The units were left in the chamber for a period of 96 hours at -40C per the IEC 61300-2-17 with insertion and return loss readings being taken daily on the paired configurations. Electrical testing was done pre and post testing.

Hot Dry Testing (To +85C):

Five paired units were placed into the environmental chamber. The units were left in the chamber for a period of 96 hours at +85C per the IEC 61300-2-18 with insertion and return loss readings being taken daily on the paired configurations. Electrical testing was done pre and post testing.

Immersion Testing:

Three paired units were placed into the water column per IEC 60529 section 14.2. The units were left in the column at a level of six feet for a period of 48 hours. The units were then removed from the column, external surfaces dried and internal surfaces verified for migration. Optical and electrical testing was done pre and post testing after external drying.

5 Test Documentation

Section	Test Procedure	Winchester Reference	Testing Location
1	Thermal Shock	TR_54K_7763-3-3 & 7765-3-3_Thermal Shock	Wallingford – CT
2	Moisture / Humidity Resistance	TR_54K_7763-3-3 & 7765-3-3_Humidity_Moisture	Wallingford – CT
3	Mechanical Retention (Mating/Un-mating Forces)	TR_54K_7763-3-3 & 7765-3-3_Mechanical Retention	Wallingford – CT
4	Cable Retention	TR_54K_7763-3-3 & 7765-3-3_Cable Retention	Wallingford – CT
5	Vibration	TR_54K_7763-3-3 & 7765-3-3_Vibration	Wallingford – CT
6	Shock	TR_54K_7763-3-3 & 7765-3-3_Shock	Wallingford – CT
7.1	Mating Durability	TR_54K_7763-3-3 & 7765-3-3_ KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector to KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector	Franklin – MA
7.2	Mating Durability	TR_54K_7763-3-3 & 7765-3-3 to 1,000 Cycles	Wallingford – CT
8.1	Intermateability	TR_54K_7763-3-3 & 7765-3-3_Lemo to KINGS® Fiber Optic Tri-Loc® SMPTE Camera Connector to 500 Cycles	Franklin – MA
8.2	Intermateability	TR_54K_7763-3-3 & 7765-3-3 to 100	Franklin – MA
9	Corrosion (Salt Spray)	TR_54K_7763-3-3 & 7765-3-3_Corrosion(Salt Spray)	Wallingford - CT
10	Contact Retention	TR_54K_7763-3-3 & 7765-3-3_Contact Retention	Wallingford - CT
11	Drop (Impact)	TR_54K_7763-3-3 & 7765-3-3_Drop	Franklin - MA
12	Cold -40C	TR_54K_7763-3-3 & 7765-3-3_Cold to -40C	Franklin - MA
13	Hot Dry +85C	TR_54K_7763-3-3 & 7765-3-3_Dry Heat to +85C	Franklin - MA
14	Immersion	TR_54K_7763-3-3 & 7765-3-3_Water Immersion	Franklin - MA